Hotbeds and Cold Frames

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HOTBEDS

The hotbed is a valuable asset to the commercial gardener and to the home gardener alike. There are many crops generally desired in all gardens that will not mature a full crop when planted in the ordinary manner. These crops must have the advantage of a longer season, and the hotbed makes this possible. There are also some crops that do best in the cool moist spring and must be started in hotbeds to be given the advantage of maturing at the proper season.

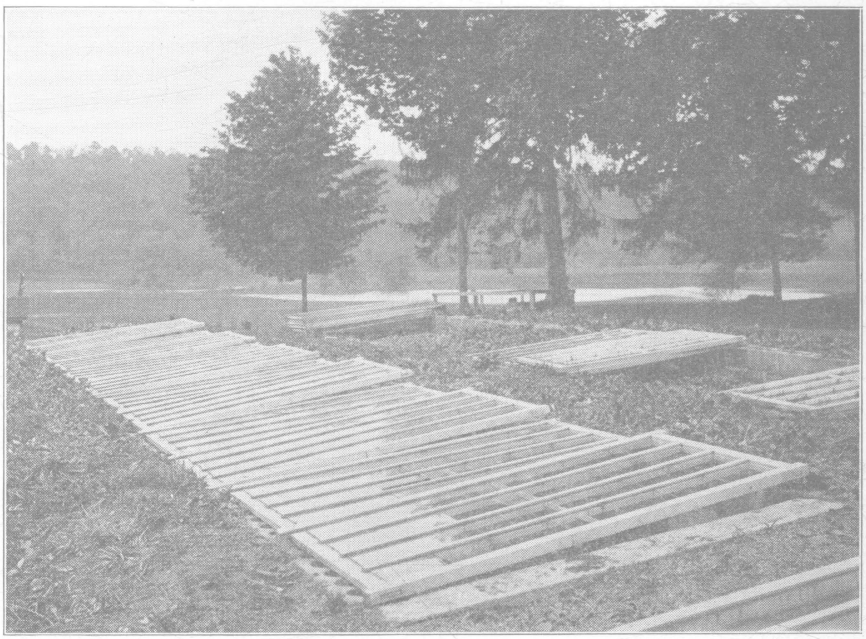

Fig. 1.—A well-banked hotbed with sash raised for ventilation

The home gardener may use a hotbed for several purposes, such as starting tomatoes, cabbage, head lettuce, etc., or in matur-

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FREE—Cooperative Agricultural Extension Work—Acts of May 8 and June 30, 1914.

ing leaf lettuce, radishes, and green onions several weeks in advance of the season.

The commercial gardener cannot afford to be without a hotbed, as he depends on many long-season crops for his living, and, if he cannot build a plant house the hotbed affords him the same advantages. He has also found that he can grow plants that are of the necessary size, free from disease, and true to name, much cheaper than he can purchase them.

Location.—The hotbed should be built in a protected place, such as the south side of a fence or building, but not where it will be shaded by trees or buildings. It should be placed near the house where it can be easily tended, where water is close, on a piece of soil that is well drained (especially if the pit bed is built), and should slope to the south.

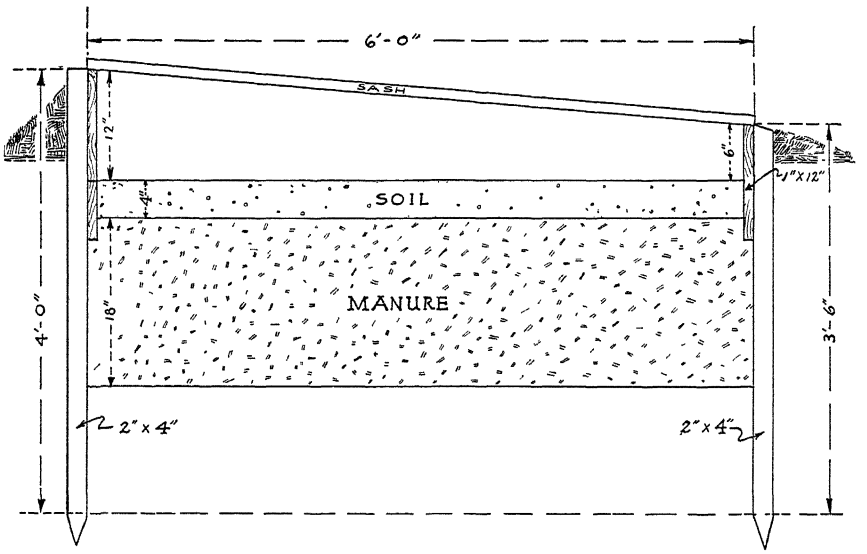

Fig. 2.—Cross section of hotbed (pit style)

TYPES OF HOTBEDS

There are many types of hotbeds in use in the various sections, chief among these are: steam-heated, hot-air-heated, hot-water-heated, and manure-heated.

We will only concern ourselves with the manure-heated type. Of this type there are two forms in common use, the surface bed, in which the frame is placed on a flat pile of manure; and the pit bed, where the frame and the manure are placed in an excavation.

THE PIT BED

Pit hotbeds are most satisfactory, as they give more protection to the plants, especially early in the season. They require less manure than the surface bed and during the colder weather will keep a more even temperature and for a longer period of time.

In constructing the hotbed, it is best to dig the pit in the fall and fill it with mulch to keep the walls from freezing. The pit should be 24 inches deep and wide enough to care for the frame or about 6 feet 4 inches, and as long as is desired. Fig. 2 shows a cross section of a pit bed from back to front.

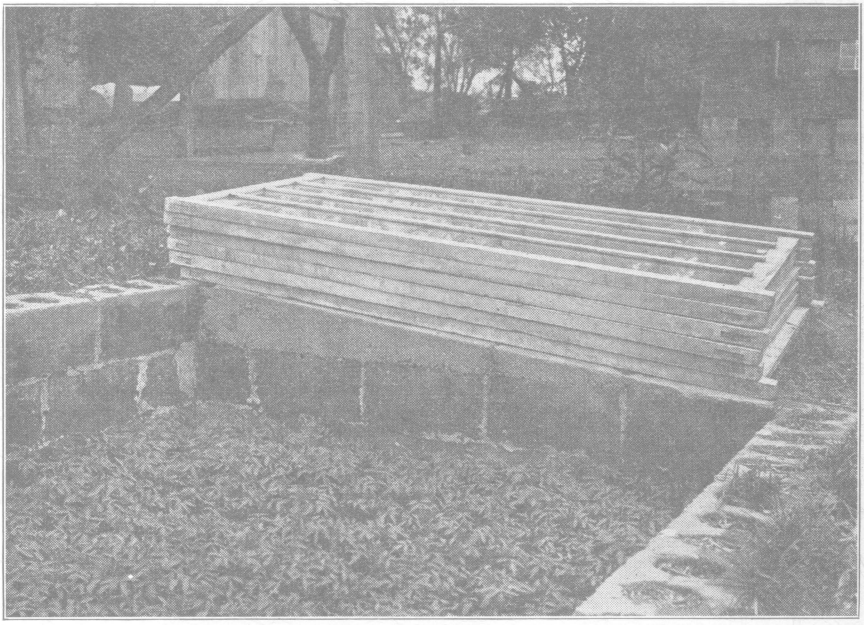

Fig. 3.—Excellent type of hotbed with a cement block foundation, finished at ends with poured concrete

If a permanent bed is desired the walls may be lined with boards, bricks, or concrete, and built to include the frame. This merely requires filling with manure and soil to the proper depth each year.

Frame.—The frame should be made to fit snugly at all edges, so the heat may be conserved. The front, or south side, of the bed should be lower than the opposite side, permitting fuller use of the sunlight.

In constructing the hotbed shown in Fig. 2, 2 by 4's are driven in at the corners and at 6-foot or 8-foot spaces on both sides. Inch

planks are nailed to these. A 12-inch and a 6-inch plank are used on the north side, the joint placed below the surface of the soil, and a 12-inch plank is used on the south side.

Sash bars may be used every 3 feet to stiffen the frame and serve as a support for the sash. These bars are made of material 1 by 2 inches. Soil is then drawn up to the planks from the outside until only 1 or 2 inches are exposed; this gives added protection from the cold.

An excellent type of permanent bed may be constructed of cement blocks, as shown in Fig. 3. This bed is 24 inches deep on

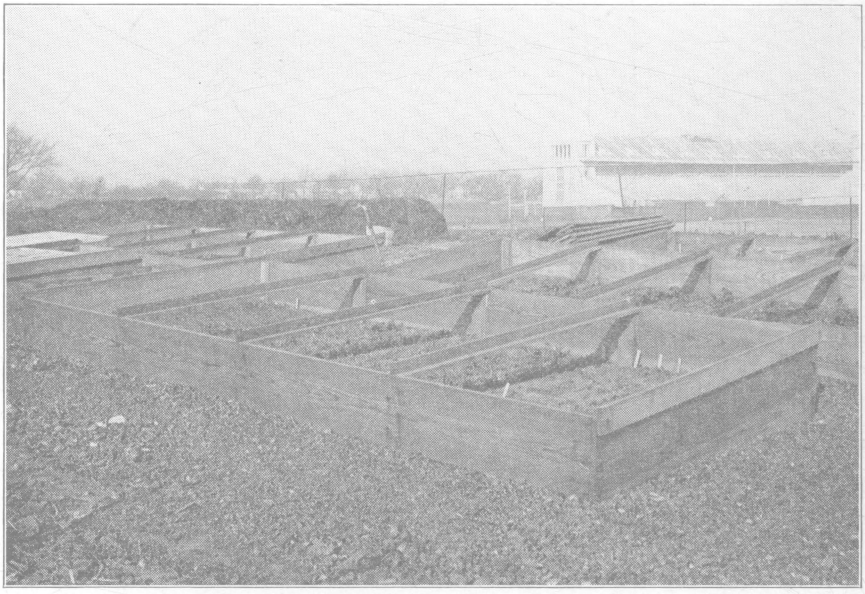

Fig. 4.—A view of the cold frames at the University

the south side and 32 inches deep on the north side. This gives the sash a pitch of 8 inches, or the height of one block.

Forms are placed at the two ends and filled with concrete. Dead-men, made of 2 by 4 inch pieces about 2 feet long, are sunk at 10-foot spaces and about 5 feet back from side walls. Iron bars extend from the dead-men to the inside of the walls, where they are attached to vertical iron bars. This arrangement will prevent the side walls from pressing in. If two beds are to be built the tie rod on the south side of the first bed may be anchored to the inside north wall of the second bed. Soil is then drawn up on the outside until not more than 2 inches of the concrete block is showing. The holes in the block may be filled with sawdust.

Sash.—The sash may be of any size, although if they are to be bought it will be best to obtain the standard size, 3 feet by 6 feet. Sash may be obtained with either a single or double glass. The double glass, having a dead air space between them, conserve the heat to better advantage and are preferable for early hotbeds, but are harder to clean and heavier to handle than the single glazed sash.

Manure.—Fresh horse manure without much straw or litter should be used for heating. Two weeks before time of making up the bed a sufficient quantity of manure is thrown in a pile and al-

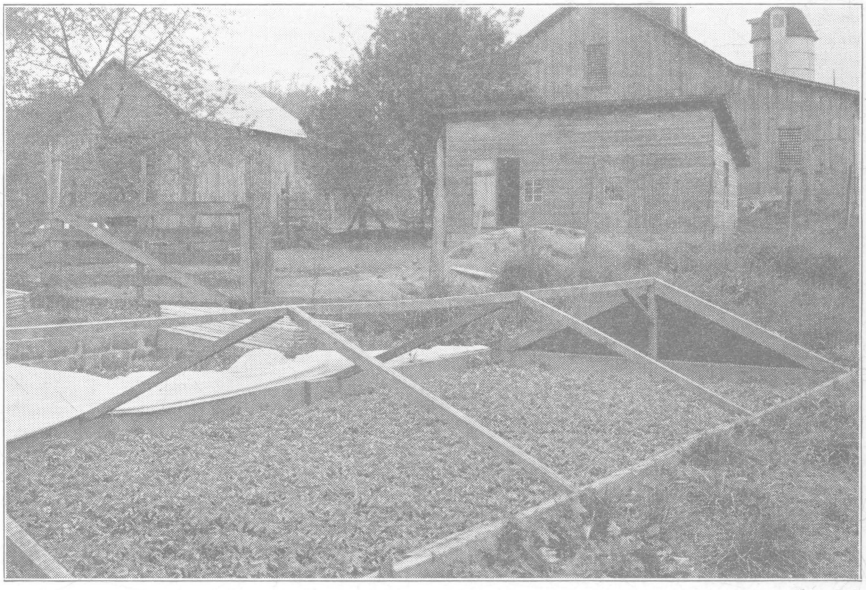

Fig. 5.—Cold frame on permanent foundation, equipped with frame for a canvas cover

lowed to heat. This is forked over occasionally, the cold manure thrown towards the center allowing it to heat evenly without burning. After the manure has heated through it should be spread evenly in the pit, each forkful shaken out thoroughly, and then packed by tramping, until there is a compact bed of from 12 to 18 inches deep. In tramping, careful attention should be given to the sides and corners to prevent uneven settling after the seed has been sown. After the manure has been packed solidly it is advisable to shake in 3 or 4 inches of loose straw, as this gives a more even distribution of heat and does away with "hot spots" in the beds. If the manure is dry or does not heat rapidly it can be hastened by sprinkling lightly with water.

Soil.—The soil should be friable and loose, should contain a large amount of organic matter such as well rotted manure, straw or leaf mold, and about one-fourth sand. This allows even heating and proper drainage. From 4 to 6 inches of well prepared soil should be used. This should be raked level and should be from 6 to 8 inches below the glass on the south or low side.

The bed should be constructed and filled a week or ten days before seeding. After the manure and soil are in place the sash are put on and the bed allowed to heat. A soil thermometer should be placed in the bed. The temperature will run very high for a few days, and when this recedes to 70 or 80° F. the seed may be planted.

THE SURFACE BED

The surface bed is constructed by packing the manure as for the pit bed, but on the surface of the soil. The frame is then placed on the pile of manure and the soil placed within the frame. Manure is then piled around the frame until only the sash is exposed. The bed does not have the 6-inch pitch of the pit bed, but should be sloped from 3 to 4 inches to the south.

The frame may be constructed as shown in Fig. 4, and may be of any convenient size. This type of bed lends itself nicely to the home gardener.

It is easily constructed, may be placed against the north fence and is easily removed when the necessity for using it is over. It is more easily cared for than the pit bed because of its being raised. However, it takes more manure and does not hold the heat as well.

COLD FRAMES

The cold frame may be built similar to a hotbed, with the exception of having no bottom heat. Only a shallow pit is dug and a plank frame set in. Soil is used similar to that in a hotbed. The back of the frame is made 6 inches higher than the front and either glass sash or cloth is used.

If permanent beds are constructed a frame similar to that shown in Fig. 5 may be placed on the brick or concrete wall and a cloth covering used as is shown in Fig. 6.

Another type of cold frame in general use in southern Ohio is a plank frame 9 feet wide and as long as is needed, usually made in beds 50 feet long, inside measurement. A ridge pole is used in the center and is fixed 2 feet 2 inches higher than the frame; cloth is then stretched from one side, over the ridge pole to the other side. This type has proven very satisfactory.

If the frame is more than 10 feet long, additional supports will be needed, extending from the ridge pole to the plank frame; these

stiffen the frame and serve as supports for the cloth covering. If the frame is placed on the falls of a permanent bed, it should extend to within 2 inches of the outside of the walls. This type of frame allows seedlings room to grow without crowding and becoming spindly.

MANAGEMENT OF HOTBEDS AND COLD FRAMES

Seeding.—Time of seeding will depend on the crop and season of year it is to mature. After temperature has receded to 70 or 80 degrees seeds may be planted without danger of injury by heat. Thinning and weeding are facilitated by putting seeds in drills from 2 to 3 inches apart; usually a larger number of seedlings per sash are grown this way. Small seeds must be covered very lightly.

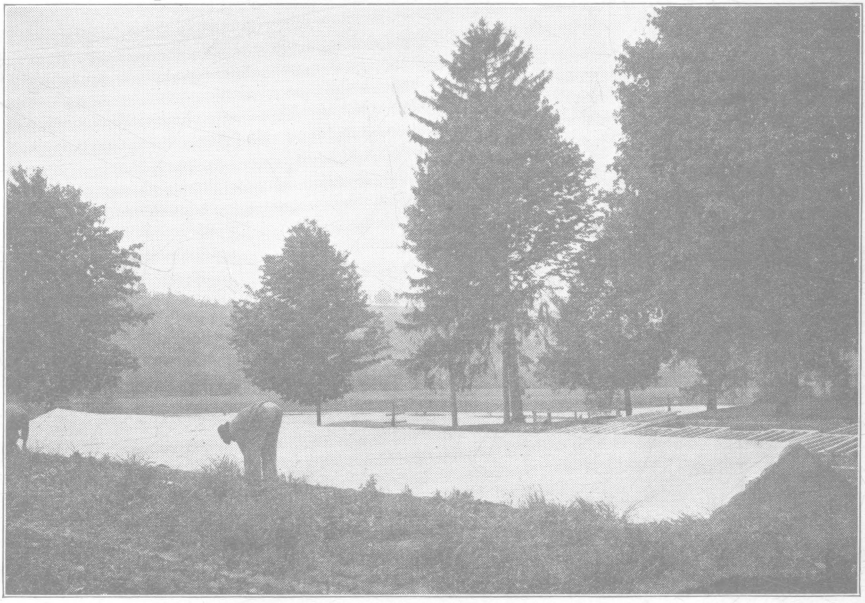

Fig. 6.—The hotbed illustrated in Fig. 1 is here shown converted into a cold frame, equipped with frame shown in Fig. 5 and covered with canvas

Care in Handling Seedlings.—After the seedlings are up, care must be used in watering and ventilating, for at this stage a lack of fresh air and too much moisture induces "damping off," and a large number of plants may be lost. Proper ventilation may be had by placing a block under one side of each sash, preferably the opposite side from which any wind may be blowing. Fresh air must be given the beds for a short time during the warmer part of each day. If the weather is severe the beds may need additional cover, especially at night. This may be had by using mats of straw, canvas, burlap sacks or boards.

When the true leaves have formed, the plants should be thinned in the drills and extra plants transplanted to secondary hotbeds that were started for this purpose. This is usually from 3 to 5 weeks after seed is planted. In transplanting to other hotbeds, plants taken from one sash, require about six when set 2 by 2 inches.

Seedlings are allowed to grow here until they begin to crowd. They are then transplanted to cold frames, where they are set 4 by 4 inches or 6 by 6 inches apart.

One sash seeded in drills 2 inches apart should transplant six sash, set 2 by 2 inches apart; the cold frame required for these plants would have to be 9 by 50 feet or 6 by 75 feet.

If at any time during the early season the plants grow too rapidly and become spindly, due to warm cloudy weather, they may be checked somewhat by drying off the beds until the weather becomes more suitable.

Hardening the Plants.—Plants grown in the hotbed are very tender and should never be set in the field until fully accustomed to cooler temperatures. During the warm part of the day air should be given daily. After the seedlings have been transplanted to cold frames the season is usually far enough advanced that the cover may be left off for several hours at a time and replaced as the day advances and becomes cooler. As the time for field setting approaches, the cover may be left off the cold frame for longer periods, until three or four days before transplanting, when the cover is left off altogether.

Care of Soil.—Hotbed and cold frame soils easily become infected with bacteria and fungi that cause plant diseases, and many field troubles are started in hotbeds, as diseases of most kinds will live over on organic matter in the soil. To correct this condition, hotbed and cold frame soil should be either changed every year or two or sterilized either with steam or formaldehyde.

If steam is available this is the best form of sterilization. Either a steam harrow or pan may be used. Steaming should reach to the depth of the soil and manure in the bed (at least 18 inches) and each area of pan or harrow steamed for 20 minutes. If formaldehyde is used 1 gallon of 40 per cent formalin is diluted with 25 gallons of water. This will cover a space of 50 square feet and may be applied with a sprinkling can or by a hose from a larger container.

After the bed has been treated, the soil should be covered with canvas or sacks, the sash put in place and remain covered for three or four days, then opened up and aired thoroughly.